

# **RESEARCH CALL TO DOE NATIONAL LABORATORIES**



## **RESEARCH AND DEVELOPMENT ACTIVITIES TO SUPPORT SOLID-STATE LIGHTING CORE TECHNOLOGIES**

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**ISSUE DATE: May 15, 2006**  
**DUE DATE: June 30, 2006**

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## SECTION I – GENERAL INFORMATION

### 1.1 SUMMARY

#### 1 Solid-State Lighting

*Goal:* By 2025, develop advanced solid-state lighting technologies that compared to conventional lighting technologies, are much more energy efficient, longer lasting, and cost competitive by targeting a product system efficiency of 50 percent with lighting that accurately reproduces sunlight spectrum.

The Department of Energy (DOE), National Energy Technology Laboratory (NETL), on behalf of the Office of Energy Efficiency and Renewable Energy's (EERE) Building Technologies Program (BT), is seeking applications for applied research in the Solid-State Lighting (SSL) Core Technologies<sup>1</sup> Program.

DOE has set aggressive and ambitious goals for SSL Research and Development (R&D): By 2025, to develop advanced solid-state lighting technologies that, compared to conventional lighting technologies, are much more energy efficient, longer lasting, and cost-competitive. The focus of the present Laboratory Call is to

support applied research in certain key technical areas by fostering a collaborative atmosphere favorable to overcoming the significant technical challenges that restrict the application of SSL today to only relatively low luminous output products.

While the current generation of SSL products is commercially viable, they are most often used in markets that do not produce the large energy conservation objectives sought by DOE. Moreover, the technical challenges that impede penetration into mainstream general illumination markets are complex and require the combined resources of many researchers and, perhaps, the unique research tools found only at a limited number of universities, National Laboratories, and research institutions. It may be difficult to overcome these critical technical challenges without a focused Government initiative.

### 1.2 Background Information

The lighting industry is nearly 100 years old and is often characterized as a mature industry. The DOE's BT Program selected lighting as one of the principle target markets for the development of more efficient technologies since it represents one-fifth of the national electrical consumption. The DOE has provided assistance over the past several years with significant effort invested by industry, academia and Government; the prevailing theme that has surfaced repeatedly is that the promise of solid-state lighting will only be produced through a focused and concentrated effort between the stakeholders.

Electricity consumed for lighting represents about 8.2 Quads or nearly 8.5 % of all the primary energy consumed annually by the Nation. Lighting also consumes 22% of all electricity in buildings.

Today, the lighting industry in North America is worth approximately \$12.7 Billion in sales annually. Of this amount, approximately \$3.3 Billion is associated with lamps while the remaining sales are divided up between fixtures, components (including ballasts and controls) and services such as design and maintenance. High brightness Light Emitting Diode (LED) sales, a popular product thought by many to be the nearest term solution to SSL, is already a \$1 to \$2 Billion business with exponential growth prospects.

<sup>1</sup> Definition of Core research can be found at [www.netl.doe.gov/ssl/definition.html](http://www.netl.doe.gov/ssl/definition.html)

To address these issues and to advance energy conservation in lighting in US Buildings, the DOE's Building Technologies Program maintains a Lighting Research and Development (LR&D) activity. Key to the objectives of this activity is its mission statement.

**Lighting Research and Development Program**

*Mission:*

To increase end-use efficiency in buildings by aggressively researching new and evolving lighting technologies, in close collaboration with partners, to develop viable methodologies that have the technical potential to conserve 50% of electric lighting consumption by 2025.

To insure that its research portfolio meets critical and evolving needs in a timely fashion, the LR&D activity has hosted and continues to host industry-led efforts to develop and maintain a series of technology road maps for the various technologies that comprise the lighting business. While not the only lighting technology of interest within the Building Technologies Program portfolio, SSL is the *singular* focus of the present Laboratory Call.

The SSL portfolio has developed a specific statement of objectives tailored to the aggressive needs suitable for general illumination applications. It targets aggressive performance goals that, if met and successfully deployed into the marketplace, will achieve the energy

conservation goals of the LR&D program while meeting or exceeding the performance attributes of electric light that allows for direct comparison to natural sunlight spectra.

This Laboratory Call is the third Core Research Opportunity released to the National Laboratories. As the relevant SSL technology base matures, it is anticipated that the level of technology maturation will advance from the present level, applied research, to market conditioning once the targets for efficiency, cost, longevity, stability and control are demonstrated in a product environment.

The DOE envisions a LR&D Program that works together with the SSL industry to meet the program's goal by the year 2025. Critical to this LR&D Program are seven important aspects:

- Emphasize Competition
- Cost (and Risk) Sharing
- Partners Involved in Planning and Funding
- Targeted Research for Focused Need
- Innovative IP Provisions
- Open Information and Process
- Success Determined by Milestones Met and Ultimately Energy Efficient, Long-life and Cost-competitive Products Developed

In order to achieve these goals a partnership was awarded via Memorandum of Agreement (MOA) to the Next Generation Lighting Industry Alliance (NGLIA). The purpose of the NGLIA is to provide input and prioritization of the core technology needs, provide administrative expertise and staffing to organize and conduct technical meetings and workshops, and support demonstrations of SSL technologies, among others.

Additionally, the SSL program has implemented innovative Intellectual Property provisions. This program has been granted an exceptional circumstances determination under the Bayh-Dole Act. The exceptional circumstances determination applies to awards under the Core Technologies Program and is expected to stimulate commercial utilization of new technology developed by Core awardees. This potentially benefits product participants by pushing the availability of the core technology to them. The Core Technology Program participants will also benefit by having a ready set of potential licensees to which to license their invention(s), and, if the SSL Partnership members are successful in commercializing their lighting systems, may reap income in the form of royalties. The determination also requires substantial manufacturing in the US of products embodying new inventions. More detailed

information about the Exceptional Circumstances Determination can be found at: [http://www.netl.doe.gov/ssl/PDFs/SSL%20Determination%20-%20Signed%20June%202005\\_1.pdf](http://www.netl.doe.gov/ssl/PDFs/SSL%20Determination%20-%20Signed%20June%202005_1.pdf).

### 1.3 FUNDING OPPORTUNITY OBJECTIVES

The focus of this Laboratory Call is to insure that the LR&D portfolio of SSL technology sufficiently addresses the Core Technologies that can be readily and widely applied to existing and future lighting products, which in turn will be energy efficient and cost competitive. Applications are sought that are truly innovative and groundbreaking, fill technology gaps, provide enabling knowledge or data, and will represent a significant advancement in the SSL technology base.

Core Technology Research will provide the focused applied research needed to advance SSL technology – research that is typically longer-term in nature and not the focus of sustained industry investment. Through this Laboratory Call, the DOE will fund research efforts at National Laboratories.

Of specific interest to this Laboratory Call is the application of specialized tools and equipment, unique to a National Laboratory, to solid-state lighting research. National Laboratories, by nature of their history and funding mechanisms, have specialized, unique, expensive equipment that does not exist anywhere else. This equipment may provide critical research or capability to the DOE SSL program. National Laboratory applicants to this announcement should highlight their unique capabilities for research in the following Areas of Interest.

### 1.4 PROGRAM AREAS OF INTEREST

The Program Areas of Interest for this Lab Call were chosen based on research areas identified at the DOE SSL Workshop in February 2005, the recently released DOE Multi-Year Program Plan, and the status of the DOE project portfolio. The complete report from the 2005 DOE SSL Workshop and the recently released Multi-Year Program Plan are available at [www.netl.doe.gov/ssl/](http://www.netl.doe.gov/ssl/). Additionally, information on the DOE SSL portfolio is available at [www.netl.doe.gov/ssl/project.html](http://www.netl.doe.gov/ssl/project.html). In response to these guidelines, the Program Areas of Interest were developed for this Lab Call. The Areas of Interest target innovations in both Light Emitting Diodes (LED) and Organic Light Emitting Diodes (OLED). Descriptive information on each of these four Areas of Interest is provided in the following paragraphs:

#### **LEDs**

The LED Areas of Interest address two components of device efficiency: Internal Quantum Efficiency (IQE) and extraction efficiency which are the two major limiting factors preventing higher performance LED devices. Improved device efficiency is the primary goal of research in the LED area, but cost and manufacturability should be addressed in the proposal as well. Applicants must demonstrate that the proposed work builds upon earlier research. In the LED field, applications should target only one Area of Interest, IQE or extraction efficiency.

#### **Area of Interest 1. *Internal Quantum Efficiency (IQE) – Task 1.1***<sup>2</sup>

In order to meet the DOE luminous efficacy goals<sup>3</sup> ahead of schedule, more research is required in the area of internal quantum efficiency (IQE) of LED devices. The DOE goal for IQE is 90% across the spectrum by 2025. Research in IQE benefits both color mixing and phosphor converted LED lighting solutions. Improvements in the IQE across the visible spectrum will improve the efficiency and color

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<sup>2</sup> Tasks and subtasks are from [www.netl.doe.gov/ssl/PDFs/DOE\\_SSL\\_Workshop\\_Report\\_Feb2005.pdf](http://www.netl.doe.gov/ssl/PDFs/DOE_SSL_Workshop_Report_Feb2005.pdf)

<sup>3</sup> DOE SSL goals can be found in the DOE SSL Multi-Year Program Plan at [www.netl.doe.gov/ssl/](http://www.netl.doe.gov/ssl/)

rendering for the color mixed approach. Whereas, enhancing the IQE in blue, violet, and ultra-violet spectrum will improve the efficiency for the phosphor converted approach.

Two distinct approaches will be considered for the improvement of IQE. The first approach is research in *High Efficiency Semiconductor Materials – subtask 1.1.2*. Across the emission spectrum of nitrides the IQE is less than for LED emitters in the red and infrared. Deep green emitters, in particular, suffer from low IQE. Proposals are sought that specifically address the improvement of IQE through the epitaxial process. This includes, but is not limited to, bandgap engineering of the active region i.e. novel growth structures, quaternary materials, novel alloys, the use of nanostructures within the active region, and study/control of the role of indium in the active region. Successful applicants must address IQE improvements beyond the current levels in solid-state lighting. Preference will be given to projects that demonstrate the highest potential for improvement from current levels. Demonstrable and quantifiable improvements in the IQE are the suggested milestones for this Area of Interest.

The second approach to improving IQE in LEDs is research in *Reliability and defect physics for improved emitter lifetime and efficiency – subtask 1.1.3*. The IQE of an LED is adversely affected by the crystal defects of the epitaxial material which decrease device lifetime and performance at high power. Proposals are sought that address defect reduction and/or mitigation in the epitaxial process. This research includes, but is not limited to, novel growth structures, improved epitaxial growth processes, studies in defect and dopant physics, and studies in the mitigation of defects at high current operation of LEDs. Demonstrable and quantifiable reduction of defect density, reduction in device efficiency roll-off at high current operation, and improvement of IQE are suggested milestones for the proposed projects.

**Area of Interest 2.** *Extraction efficiency: Device approaches, structures, and systems and strategies for improved light extraction – Sub-tasks 1.2.1 and 1.2.2*

Vast improvements have been made recently in the extraction efficiency of LEDs. Surface roughening, chip shaping, reflective coating, and device thinning, among other techniques, have been shown to enhance the light extraction from LED chips. However the next technological leap needs to be made in order to achieve the DOE goal of 90% extraction efficiency before 2025. To achieve this goal ahead of schedule a combination of device architecture techniques (subtask 1.2.1) and strategies for improved light extraction (subtask 1.2.2) will need to be employed. Proposals are sought for research to improve the extraction efficiency of LEDs beyond the current state of the art. Applicants should propose to demonstrate improvements in device efficiency through advancements in light extraction efficiency and list these improvements as milestones.

## **OLEDs**

There are two specific OLED Areas of Interest for this Laboratory Call. Applications may propose research that targets a single Area or both Areas.

**Area of Interest 3.** *Materials Research - High efficiency, low voltage, stable materials – subtask 3.1.2*

For this Area of Interest research is sought in the development of high efficiency, low voltage, and stable OLED materials. Specifically, the DOE is looking for applied research in emitting materials that will efficiently emit light and show improvements in operating lifetime. One area of particular concern is the high operating voltage of OLEDs which limits device luminous efficacy. Improved carrier transport materials, blocking materials, materials that use integrated nano-structures, and inorganic-organic hybrid materials are all candidates for research under this materials topic. Improvements made in device efficacy should not come at the expense of device stability. Proposals for research in materials that exhibit

enhanced stability, particularly at high current operation, are also sought. The proposals in this area should build upon prior research which will now be applied to the field of OLEDs for solid-state lighting. The milestones of this research should be measurable improvements in device efficiency and improved device lifetimes.

**Area of Interest 4.** *Approaches to OLED structures between the electrodes for improved performance low-cost white-light devices – subtask 3.2.2*

Research is sought in optimized OLED device architecture for improved device performance of white light emitters. Proposals are sought specifically for white OLED emitters. Device stability, operating voltage, and high luminance performance are potential topics of research in this area. While this technology is not currently at a level where device cost is a primary concern, applicants to this area should consider manufacturability and cost of fabrication in their proposal. Proposals to Area 4, whether independent of or inclusive of Area 3, must address white light emitting OLEDs.

## **SECTION II: REQUIREMENTS AND ELIGIBILITY**

### **2.1 ELIGIBLE APPLICANTS**

All DOE National Laboratories are encouraged to submit proposals in response to this Laboratory Call. For-profit, non-profit, state and local governments, Indian Tribes, and institutions of higher education are not eligible for this Laboratory Call, but are encouraged to submit proposals to the companion Funding Opportunity Announcement DE-PS26-06NT42831. All proposed team members must accept the Exceptional Circumstances language found in Section II Part 7.0. Teaming with other DOE National Laboratories is acceptable if this teaming leads to a greater likelihood of achieving the goals of the SSL program in a timely fashion. Industry and Universities are excluded from participating as subcontractors unless they are providing some sort of general service as opposed to research.

### **2.2 TYPE OF AWARD INSTRUMENT**

Any project awarded as a result of the Laboratory Call will be processed through the NETL Financial Management Office as a Field Work Proposal, an Interoffice Work Order or any other allowable method deemed appropriate by the Government.

### **2.3 ESTIMATED FUNDING**

Approximately \$3.75 million dollars is expected to be available for new awards under this laboratory call, funded over multiple government fiscal years.

### **2.4 EXPECTED NUMBER OF AWARDS**

DOE anticipates making approximately 2-5 awards next fiscal year under this Laboratory Call. However, the Government reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this laboratory call and will award that number of instruments which serves the public purpose and is in the best interest of the Government. In addition, the Government reserves the right to make “conditional selections” in the event that future funding should become available.

## **2.5 ESTIMATED AWARD SIZE**

DOE anticipates that awards will not exceed the amount set forth below. However, applicants are not encouraged to try to equal these estimates but should offer logical work plans and appropriate costs:

Project Period Length	Maximum Federal Share
12 months	\$ 600,000
12 - 24 months	\$1,200,000
24 – 36 months	\$1,800,000

This information is for estimating purposes only and in no way commits the Government.

## **2.6 PERIOD OF PERFORMANCE**

DOE anticipates making awards that will range from twelve (12) months to thirty-six (36) months. Awards will have project and budget periods that are specific to the project and funding.

## **2.7 EXCEPTIONAL CIRCUMSTANCES**

Regarding any award made to a National Laboratory under this Laboratory Call, the Department of Energy has approved a determination titled “Exceptional Circumstances Determination for Inventions Arising Under the Solid-State Lighting Core Technologies Program.” This Determination is based on the Department’s belief that circumstances surrounding the Solid-State Lighting Core Technologies Program are exceptional and justify modified intellectual property arrangements as allowed by the Bayh-Dole Act (35 U.S.C. 202(a)(ii)). More detailed information about the Exceptional Circumstances Determination can be found at [http://www.netl.doe.gov/ssl/PDFs/SSL%20Determination%20-%20Signed%20June%202005\\_1.pdf](http://www.netl.doe.gov/ssl/PDFs/SSL%20Determination%20-%20Signed%20June%202005_1.pdf)

The Department of Energy intends that disposition of rights to subject inventions made by a National Laboratory under awards resulting from this announcement will be subject to the terms of this Determination. The restriction of patent rights under the Determination will be basically as described in the following paragraph. The Department is requiring minimum licensing rights that the Core Technology Program recipients will have to agree to. Under 35 U.S.C. § 203(2), an awardee adversely affected by this exceptional circumstance determination has a right to appeal the determination to the Department of Energy or to the United States Court of Federal Claims.

All recipients under this lab call shall be required to offer to each member of the Solid-state Lighting Partnership (i.e., the Next Generation Lighting Industry Alliance (NGLIA)) the option to enter into a non-exclusive license in the field of solid-state lighting applications for subject inventions developed under the Core Technologies Program. Such licenses shall be granted upon terms that are reasonable under the circumstances, including royalties. This option shall only be available to NGLIA members and must be kept available for one year after the U.S. patent issues. After this one-year period, the Core recipient will be free from the licensing restrictions. The Core recipient must agree to negotiate in good faith with any and all NGLIA members that indicate a desire to obtain at least a non-exclusive license. Exclusive licensing may be considered if only one NGLIA member expresses an interest in licensing the invention. Partially exclusive licenses in a defined field of use may be granted to a NGLIA member, provided such license would not preclude any other NGLIA member that indicates a desire to license the invention from being granted at least a non-exclusive license. In the event the Core Recipient and a NGLIA member cannot reach agreement after nine months from the start of diligent and responsible negotiations between them, the NGLIA member shall have the right of a third party beneficiary to maintain an action in a court

of competent jurisdiction to force licensing of the subject invention on reasonable terms and conditions. The licensing of any background patents owned by the Core recipient is not required.

### **SECTION III: SUBMISSION INSTRUCTIONS**

#### **3.1 SUBMISSION INSTRUCTIONS**

Proposals shall be submitted electronically to the following email address **no later than June 30, 2006 at 8:00 pm EST**:

P. Morgan Pattison, Project Manager  
US Department of Energy  
National Energy Technology Laboratory  
[paul.pattison@netl.doe.gov](mailto:paul.pattison@netl.doe.gov)

**The applicant is encouraged to request a return notification to verify receipt of proposal.**

#### **3.2 LATE APPLICATIONS, AMENDMENTS AND WITHDRAWALS OF PROPOSALS**

A proposal or amendment of a proposal shall be considered timely if it is received on or before the closing date indicated above. Proposals or amendments of proposals may be withdrawn by written notice from an authorized representative to the above address via e-mail or in writing.

A second proposal or amendment may then be submitted. The second or subsequent proposal must be submitted before the closing date to be considered. In the event that two or more proposals are received for the same project with the same title, the proposal with the latest postmark will be considered for review. Therefore, it is important that you not merely make page changes and re-submit portions of the proposal that are amended. A complete amended proposal must be sent.

Proposals or amendments received after the closing date will not be considered.

## SECTION IV: APPLICATION PREPARATION

### 4.1 PREPARATION

It is requested that the entire proposal not exceed thirty-five (25) pages, single spaced, 1" margins (top, bottom, left, right), and when printed will fit on size 8 1/2" by 11" paper. The type must be legible and not smaller than 11 point. The Technical Content (see Section IV Part 2.4) shall not exceed twenty (20) pages of the total page limit. Evaluators will review only the number of pages specified. Any proposals exceeding these limitations may result in a weakness to their overall scored based on technical evaluation Criterion 3 – Applicant and Team Member Roles & Capabilities. In order to produce a comprehensive application for this Lab Call, the offeror shall address, at a minimum, the areas listed in the Table of Contents, below. The offeror shall use the following Table of Contents:

<b>Section</b>	<b>Page</b>
Field Work Proposal Cover Sheet	i
Public Abstract	ii
Table of Contents	iii
List of Tables	Iv
List of Figures	v
List of Acronyms	vi
Detailed Cost Analysis	vii
Technical Content	#
<b>Technical Approach</b>	#
<b>Technology Value</b>	#
<b>Applicant and Team Members Roles and Capabilities</b>	#
<b>Previous or On-going Related Work</b>	#
Appendices	#
Statement of Work (SOW)	A
Resumes of Key/Critical Personnel	B
Qualifications and Experience of Participating Organization(s)	C

### 4.2 FIELD WORK PROPOSAL COVER SHEET

The form must be completed and signed by an official who is authorized to act for the proposer and project team members (other National Laboratories) and who can commit the proposer to comply with the terms and conditions of award, if one is issued.

### 4.3 PUBLIC ABSTRACT

This section shall contain a public abstract of not more than one (1) typewritten page. The offeror shall provide a point of contact for coordination, preparation and distribution of press releases. The public abstract shall not contain confidential, proprietary, or otherwise sensitive information as it may be released by the DOE to the general public at any time.

### 4.4 DETAILED COST ANALYSIS

The applicant shall provide detailed cost information pertaining to their proposal. At a minimum, the cost analysis shall provide information regarding personnel costs, overheads, travel, equipment, and supplies. Include a supplemental schedule that identifies the labor hours, labor rates, and cost by labor classification for each budget year. Also indicate the basis of the labor classification, number of hours, and labor rates.

## **4.5 TECHNICAL CONTENT**

Begin this section by stating the project objectives and provide a clear description of the work to be done. To facilitate the review process and insure maximum consideration, the applicant should address each of the criteria below and provide all of the requested information. These elements are consistent with the technical evaluation criteria in part V of this Laboratory Call. Sufficient information should be provided to enable the reviewers to evaluate the application in accordance with these elements.

### **1. Technical Approach**

- 1.1. Provide a clear and concise statement of the scientific merits and likelihood of success of the proposed approach. Explain any areas of technical uncertainty and the basis for the approach selected.
- 1.2. Include a table of milestones for each interval of the proposed effort. Be quantitative and descriptive. Typically, projects contain one to four milestones which may be accomplished in no longer than 18 months. These milestones should relate to the determination of technical “value” as described in Criterion 2.
- 1.3. Provide a succinct Statement of Work (SOW) as described below followed by an expanded discussion of technical approach. Provide a discussion of anticipated outcomes and results.
- 1.4. Provide an innovative and novel technical approach to achieving the stated objectives. Do not duplicate or elaborate on previous or ongoing research unless a significant new or enabling development has occurred. For a list of previous and ongoing work, please refer to the SSL Portfolio at <http://www.netl.doe.gov/ssl/project.html>.

### **2. Technology “Value”**

- 2.1. Provide a discussion of how the proposed subject and approach will impact the eventual achievement of the DOE SSL mission/goal as contained in Part I of this Laboratory Call.
- 2.2. Compare the performance of the proposed approach to current SSL device technology in terms of efficiency and discuss the likelihood of exceeding current SSL performance levels.
- 2.3. Explain how the proposed approach is applicable to multiple SSL technologies or may impact other DOE energy efficiency objectives (crosscutting).
- 2.4. Provide calculations of estimated efficiency benefits compared to current SSL technology and conventional lighting technology, if applicable. Provide baseline information upon which efficiency calculations are based.
- 2.5. Explain how the proposed research will allow the DOE to achieve their SSL goals earlier than planned. Be quantitative and estimate the impact this achievement might have on cumulative lighting energy conservation.

### **3. Applicant and Team Members Roles and Capabilities**

- 3.1. Discuss the ability of the team to perform and achieve the goals stated in the SOW. This should include success in similar projects resulting in successful technology development and commercialization or technology transfer to commercial product(s). Outline the roles and responsibilities of each participant with respect to the technical approach.

- 3.2. Discuss the role of the Principal Investigator (PI) as project manager enabling the successful completion of the stated goals of the project.
- 3.3. Provide a breakdown of key personnel to SOW tasks (manpower matrix). The matrix should illustrate estimated labor hours and labor categories (e.g., project manager, principal investigator, etc.) required for each task and shall provide rolled-up total for each period. The same should also be included for any proposed subcontracting or consulting efforts. Discuss the rationale used to develop estimates for labor hours and categories, and subcontracting/consulting efforts. Cost information is not to be included in the technical proposal volume.
- 3.4. Discuss the availability of facilities and equipment. Identify any major equipment needed for the proposed project which will need to be acquired during the course of the project.

#### 4. Previous or On-going Related Work

- 4.1. Describe any linkages to current Federal programs (i.e. DOE, DARPA, DOD, NIST, etc.) and any leverage that may be relevant. Demonstrate that the early SSL conceptions have already been pursued.
- 4.2. Explain any corporate commitments that demonstrate involvement in the SSL industry.

#### **4.6 STATEMENT OF WORK (APPENDIX A) INSTRUCTIONS**

A Statement of Work shall be developed that addresses how the project objectives will be met. The Statement of Work must contain a clear, concise description of all activities to be completed during project performance and follow the structure discussed below. This section shall be restricted to 1-3 pages in length. The Statement of Work may be released to the public by DOE in whole or in part at any time. It is therefore required that it shall not contain proprietary or confidential business information.

##### **TITLE OF WORK TO BE PERFORMED**

(Insert the title of work to be performed. Be concise and descriptive. Avoid non-descriptive terms, such as 'novel' or 'innovative')

##### **A. OBJECTIVES**

Include one paragraph on the overall objective(s) of the work. Also, include objective(s) for each phase of the work.

##### **B. SCOPE OF WORK**

This section should not exceed one-half page and should summarize the effort and approach to achieve the objective(s) of the work for each Phase.

##### **C. TASKS TO BE PERFORMED**

Tasks, concisely written, should be provided in a logical sequence and should be divided into the phases of the project. This section provides a brief summary of the planned approach to this project.

##### **PHASE I**

Task 1.0 - (Title)

(Description)

Subtask 1.1 (Optional)

(Description)

Task 2.0 - (Title)

PHASE II (Optional)

Task 3.0 - (Title)

#### D. CRITICAL PATH PROJECT MILESTONES (MILESTONE PLAN/STATUS)

As a part of the approved SOPO, the Recipient will develop a Milestone Plan that will serve as the baseline for tracking performance of the project and will identify critical path project milestones (no less than 2 per calendar year) for the entire project.

During project performance, the Recipient will report the Milestone Status as part of the required quarterly Progress Report as prescribed under Attachment 4, Reporting Requirements Checklist. The Milestone Status will present actual performance in comparison with Milestone Plan, and include:

- (1) the **actual** status and progress of the project,
- (2) specific progress made toward achieving the project's critical path milestones, and,
- (3) any proposed changes in the projects schedule required to complete critical path milestones.

#### E. DELIVERABLES

The periodic, topical, and final reports shall be submitted in accordance with the attached "Federal Assistance Reporting Checklist" and the instructions accompanying the checklist.

[Note: The Recipient shall provide a list of deliverables other than those identified on the "Federal Assistance Reporting Checklist" that will be delivered. These reports shall also be identified within the text of the Statement of Project Objectives. See the following examples:

1. Task 1.1 - (Report Description)
2. Task 2.2 - (Report Description)]

#### F. BRIEFINGS/TECHNICAL PRESENTATIONS (If applicable)

The Recipient shall prepare detailed briefings for presentation to the DOE Project Officer at the NETL facility located in Pittsburgh, PA or Morgantown, WV. Briefings shall be given by the Recipient to explain the plans, progress, and results of the technical effort.

The Recipient shall provide and present a technical paper(s) at the DOE/NETL Annual Contractor's Review Meeting to be held at the NETL facility located in Pittsburgh, PA or Morgantown, WV; or other location specified by the DOE Project Officer.

The Recipient shall provide and present a technical paper(s) at the DOE/NETL Peer Review Meeting to be held at DOE Headquarters in Washington D.C.; or other location specified by the DOE Project Officer.

## **SECTION V: EVALUATION AND SELECTION**

### **5.1 INITIAL REVIEW CRITERIA**

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for an award; (2) the information required by the Laboratory Call has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the Laboratory Call.

### **5.2 MERIT REVIEW CRITERIA**

Proposals submitted in response to this funding opportunity will be evaluated and scored in accordance with the criteria and weights listed below:

1. TECHNICAL APPROACH (CRITERION 1) – 30%
  - Validity of the proposed approach, the likelihood of success, and the scientific merit of the key technology issues addressed.
  - Comprehensiveness of the proposed technical milestones for each interval of the proposed effort with special emphasis on the descriptive, qualitative and especially quantitative, where applicable, milestone aspects. Technical realism and likelihood of success of the proposed technical milestones for each interval of the effort.
  - Thoroughness and feasibility of the proposed Statement of Work (SOW) and the anticipated outcomes and results.
  - The degree to which the proposed technical approach is innovative and its relevance to the stated objectives.
2. TECHNOLOGY “VALUE” (CRITERION 2) – 30%
  - The extent to which the proposed project will contribute to the eventual achievement of DOE’s SSL mission and/or goal.
  - The extent to which the proposed approach will surpass current performance levels in solid-state lighting.
  - The extent to which the proposed approach will contribute to multiple SSL technologies or how it may positively impact other DOE energy efficiency objectives (crosscutting).
  - The importance of the proposed work relative to the SSL mission and its potential impact on eventual SSL products.
  - Feasibility of the proposed work allowing DOE to achieve the SSL goals earlier than planned.

3. **APPLICANT AND TEAM MEMBERS ROLES AND CAPABILITIES (CRITERION 3) – 30%**
  - Adequacy of the proposed team’s abilities to achieve the goals proposed in the SOW; the level of professional and academic credentials of the proposed team members. Ability of the proposed team to successfully manage projects similar in scope and complexity.
  - Demonstrated abilities to successfully perform project management functions on projects similar in complexity and scope and reasonableness of PI’s time allotted to fulfill project management requirements.
  - Reasonableness of time allocations outlined in the manpower matrix; effectiveness of the proposed roles and responsibilities of outlined personnel in order to accomplish the SOW.
  - The adequacy (quality, availability, and appropriateness) of facilities and equipment to accommodate the proposed project.
4. **PREVIOUS OR ON-GOING RELATED WORK (CRITERION 4) – 10%**
  - Linkages to current Federal Programs (i.e., DOE, DARPA, DOD, NIST, etc.) and any leverage that may be relevant.
  - Potential benefits of the applicant’s corporate commitments or linkages to the SSL industry.

### **5.3 OTHER SELECTION FACTORS**

- The selection official will consider the following program policy factors in the selection process:

These factors, while not indicators of the Application's merit, e.g., technical excellence, cost, Applicant's ability, etc., may be essential to the process of selecting the application(s) that, individually or collectively, will best achieve the program objectives. Such factors are often beyond the control of the Applicant. Applicants should recognize that some very good applications may not receive an award because they do not fit within a mix of projects which maximizes the probability of achieving the DOE's overall R&D objectives. Therefore, the following Program Policy Factors may be used by the Selection Official to assist in determining which of the ranked application(s) shall receive DOE funding support.

1. It may be desirable to select for award a group of projects which represents a diversity of technical approaches and methods;
2. It may be desirable to support complementary and/or duplicative efforts or projects, which, when taken together, will best achieve the research goals and objectives;
3. It may be desirable to select different kinds and sizes of organizations in order to provide a balanced programmatic effort and a variety of different technical perspectives;
4. It may be desirable, because of the nature of the energy source, the type of projects envisioned, or limitations of past efforts, to select a group of projects with a broad or specific geographic distribution.

5. It may be desirable to select project(s) of less technical merit than other project(s) if such a selection will optimize use of available funds by allowing more projects to be supported and not be detrimental to the overall objectives of the program.
6. It may be desirable to select project(s) for award based on the Applicant's past Federal Award performance with respect to its potential effect on accomplishment of portfolio goals.

The above factors will be independently considered by the Selection Official in determining the optimum mix of applications that will be selected for support. These policy factors will provide the Selection Official with the capability of developing, from the competitive funding opportunity, a broad involvement of organizations and organizational ideas, which will both enhance the overall technology research effort and upgrade the program content to meet the goals of the DOE.